

Harmonizing the Classifications of Commodities to Support International Trade and E-Commerce

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Abstract

International trade and e-commerce need well developed descriptions of commodities and services. Classification systems like Harmonized Classes, Common Procurement Vocabulary, and eCl@ss contribute to the description from different perspectives and with different aims. The roles of these approaches are discussed – and the need for a future harmonization of these approaches is explained. Problems of building bridges among different systems are explained and concepts to extend hierarchical structures.

Keywords

Classification of commodities, CPV, e-commerce, eCl@ss, international trade, harmonized system

1. Introduction

International trade needs a description and classification of commodities and the World Customs Organization - WCO – developed and maintains the “Harmonized Commodity Description and Coding System” - HS - to meet these requirements from the perspectives of WCO and WTO.

In the European Union international trade is stimulated and especially in the public sector tender procurement of commodities and services is mandatory. For the classification of commodities and services here the “Common Procurement Vocabulary” – CPV – has been introduced.

For e-commerce we need a classification of commodities more focused on markets and including standardized properties for the description of commodities. A leading classification system here is eCl@ss.

These three approaches and further ones are all dealing with the description of commodities – but in different ways. That is a problem because we need bridges among the classification systems for those that must combine different approaches in international trade, e-commerce and tendering. To establish such bridges is a problem, because there are complex relationships among classes of different systems. The next level of problems arises, because all these classification systems have their own evolution and introduce new classes and structures continuously. And finally complex relationships and continuous changes are a big burden for the maintenance of the systems itself and for the maintenance of the bridges, that are not yet fully developed.

New approaches for the harmonization of the classifications are available – as discussed in [1] for example.

2. The Harmonized System - HS

The “Harmonized Commodity Description and Coding System” generally referred to as "Harmonized System" – HS - is an international product nomenclature developed by the World Customs Organization (WCO) [2]. It comprises more than 200000 commodities; each identified by a six digit code, arranged in a hierarchical structure. The system is used by more than 200 countries as a basis for their customs tariffs and for the collection of international trade statistics. Over 98 % of the merchandise in international trade is classified in terms HS. HS contributes to the harmonization of customs and trade procedures. It is used by governments, international organizations and the private sector for many other purposes such as taxes, trade policies, trade statistics, monitoring of controlled goods, rules of origin, freight tariffs, transport statistics, price monitoring, quota controls, compilation of national accounts, and economic research and analysis.

HS is organized into 21 sections and 97 chapters.

Section	Chapter	
I	01-05	Live Animals, Animal Products
II	06-14	Vegetable Products
III	15	Animal or Vegetable Fats and Oils
IV	16-24	Prepared Foodstuffs, Beverages, Tobacco
V	25-27	Mineral Products
VI	28-38	Products of Chemicals and Allied Industries
VII	39-40	Plastics, Rubbers and Articles thereof
VIII	41-43	Raw Hides, Skins, Leather, Furs
IX	44-46	Wood, Wood Products
X	47-49	Pulp of wood, Paper
XI	50-63	Textiles, Textile Articles
XII	64-67	Footwear, Headgear, ...
XIII	68-70	Articles of Stone, Glass, ...
XIV	71	Pearls, precious stones, metals, coins
XV	72-83	Base Metals, Articles of Base Metals
XVI	84-85	Machinery, Electrical Equipment, ...
XVII	86-89	Transportation Equipment, Vehicles
XVIII	90-92	Optical, Measuring, Medical Instruments, ...
XIX	93	Arms and Ammunition
XX	94-96	Miscellaneous Manufactured Articles
XXI	97	Works of Art

Table 1: Sections and chapters of HS

HS covers commodities that are not included in many other classifications system, like

0101 “Live horses, asses, mules and hinnies” in Section I and Chapter 1

8401.10.00 “Nuclear reactors” in Section XVII and Chapter 84

8802.30.00 “Airplanes and other aircraft” in Section XVII and Chapter 88

8901.20.00 “Tankers” in Section XVII and Chapter 88

Live animals are not included in eCl@ss because live animals do not play a significant role in e-commerce so far. Horses, sheep, goats, etc. are not covered by eCl@ss. For international trade and customs there are special rules to meet in trading live animals – so live animals are included in HS. Even whales and insects are covered as live animals in HS. With nuclear reactors, airplanes and ships it is similar.

HS covers about 200000 classified commodities – but there is no systematic approach to describe the properties of such commodities. In class 01.03 “Live swine” there are two subclasses to indicate the weight: 0103.91 – “Live swine - Weighing less than 50 kg” and 0103.92 - “Live swine - Weighing 50 kg or more”. Besides subclasses units of quantity are mentioned for commodities – like kg, t, m, etc.. But that cannot be compared with large sets of properties that describe commodities in the context of e-commerce from many perspectives – up to climate restrictions for technical products for example.

HS deals with commodities and not with services. Most other classification systems like eCl@ss started years ago with a focus on commodities, but today the classification of services is also very important in such systems.

3. Common Procurement Vocabulary

“Common Procurement Vocabulary” (CPV) was established by the European Parliament and the Council in 2002 (EC Regulation No 2195/2002) to support public procurement [3], [4]. In the European Union public procurement counts about 2000 billion Euros a year – 19% of the gross domestic product of the EU member states. CPV supports tendering processes and is mandatory for most tenders in public procurement – like for construction or maintenance of a street or a building. But even in case a state university in the EU wants to buy coffee for a season that is a case for tendering with the CPV code for coffee.

CPV includes 44 divisions and about 10000 classes. The following table shows part of the divisions of CPV. In contrast to HS there is a combination of divisions for commodities and

services – like 44 for commodities for construction and 45 for construction work. Furthermore repair and maintenance services, transport services, IT services, etc. play a significant role.

Division	
14	Mining, basic metals and related products
15	Food, beverages, tobacco and related products
16	Agricultural machinery
24	Chemical products
33	Medical equipments, pharmaceuticals and personal care products
34	Transport equipment and auxiliary products to transportation
43	Machinery for mining, quarrying, construction equipment
44	Construction structures and materials; auxiliary products
45	Construction work
50	Repair and maintenance services
60	Transport services (excl. Waste transport)
63	Supporting and auxiliary transport services; travel agencies services
64	Postal and telecommunications services
65	Public utilities
66	Financial and insurance services
70	Real estate services
71	Architectural, construction, engineering and inspection services
72	IT services: consulting, software development, Internet and support

Table 2: Selected divisions of CPV

4. eCl@ss

eCl@ss is a system for the classification of commodities and services to support e-commerce [5]. It was introduced in 2000 by an association - eCl@ss e.V. – and is supported by many European Companies (Volkswagen, Audi, Renault, Bayer, BASF, Deutsche Bahn, Johnson & Johnson, afim, EON, RWE, etc.). Such companies have a huge impact on their suppliers and they stimulate the classification of commodities and services to improve procurement and to optimize e-commerce processes. eCl@ss holds an established position in industry, commerce, crafts, food, services and much more in continental Europe.

With its 38000 product classes and 16000 properties, eCl@ss covers the majority of traded goods and services.

The following table shows part of eCl@ss segments – and like CPV eCl@ss covers commodities and services.

Segment	
14	Logistics (Service)
15	Maintenance (Service)
16	Food, beverage, tobacco
17	Machine, device (for special applications)
18	Equipment f. mining, metallurgical plant, rolling mill
19	Information, communication and media technology
21	Manufacturing facility, workshop equipment, tool
22	Construction technology
23	Machine element, fixing, mounting
24	Office product, facility and technic, papeterie
25	General service
26	Energy, extraction product, secondary raw material and residue
27	Electric engineering, automation, process control engineering
28	Automotive
29	Home economics, Home technology
34	Medicine, medical technology
36	Machine

Table 3: Selected segments of eCl@ss

The main advantage of eCl@ss is the definition and standardization of properties for its classes. The following table shows some properties defined for a screw in eCl@ss. There are properties dealing with technical data (length, weight, etc.), properties dealing organizational issues (manufacturer, etc.) and others.

The classification system allows the identification of a commodity – for example 23-11-01-18 “Drilling screw”. The class code is unique – the class name is available in several languages. But standardized classes alone are not enough to select or order commodities. We need standardized properties and standardized dimensions and values of properties for the description and identification of commodities. That is supported by eCl@ss and that is the main advantage of eCl@ss.

AAP805001 - Product name
AAH150001 - Screw diameter
BAA919002 - Screw length
AAI600002 - Diameter of the thread
BAA916002 - Head diameter of screw
BAA917004 - Head form
BAB664008 - Material
BAB101004 - Surface protection
AAO188001 - Weight of the contained material
BAB072003 - Tolerance
AAO676002 - Manufacturer product number
AAO677001 - Manufacturer name
AAO832002 - Standard letter to the standard number
AAO836002 - Surface protection in accordance with norm
AAO842002 - Product class in accordance with norm
AAO847002 - Product type description
AAO868001 - Key width
AAO933002 - Tolerance information in accordance with norm

Table 4: Selected properties of commodity class 23-11-01-18 Drilling screw

5. The core problem of hierarchical classification systems

In [7], [8], [12] we could show that some products in eCI@ss are classified ambiguously. In level 6 of eCI@ss pipes and pumps are included 11 out of 26 segments, wheels in 8, screws in 6 and shafts in 7 of 26 segments for example.

Pumps are in segments like “Machine device”, “Packing”, “Manufacturing”, “Construction”, “Office product”, “Electric engineering”, “Auxiliary supply”, “Medicine”. In each segment pumps have different class codes and different descriptions – and different properties. In the “Medicine” segment special medical issues are important – but not even common properties of pumps across the segments are harmonized.

The core problem in the development of such a classification system is the fact, that each segment is introduced and updated mostly independent from the others by separate teams of experts. Each segment shows products of a selected market – medical devices, construction, etc. – with perspectives of that market. The 23-11-01-01 “Hexagonal head cap screw” will be described from the perspectives of an engineer or carpenter, the 34-32-17-01 “Cortical screw” will be described from medical perspectives – and here it is very important for example that the material of the screw will not harm human bodies.

The fact that segments were introduced and updated separately caused a very high number of redundant properties – a number that cannot be maintained in future if classifications go on to

grow like today. If we can harmonize properties so that for example for all screws in all segments head diameter, screw length, head form, etc. are used in the same way, the number of properties we need in eCI@ss can be reduced by about 85%. Then maintenance of the classification system will be much easier. [7], [12]

The following figure shows the introduction of application classes to support the classification system in that way.

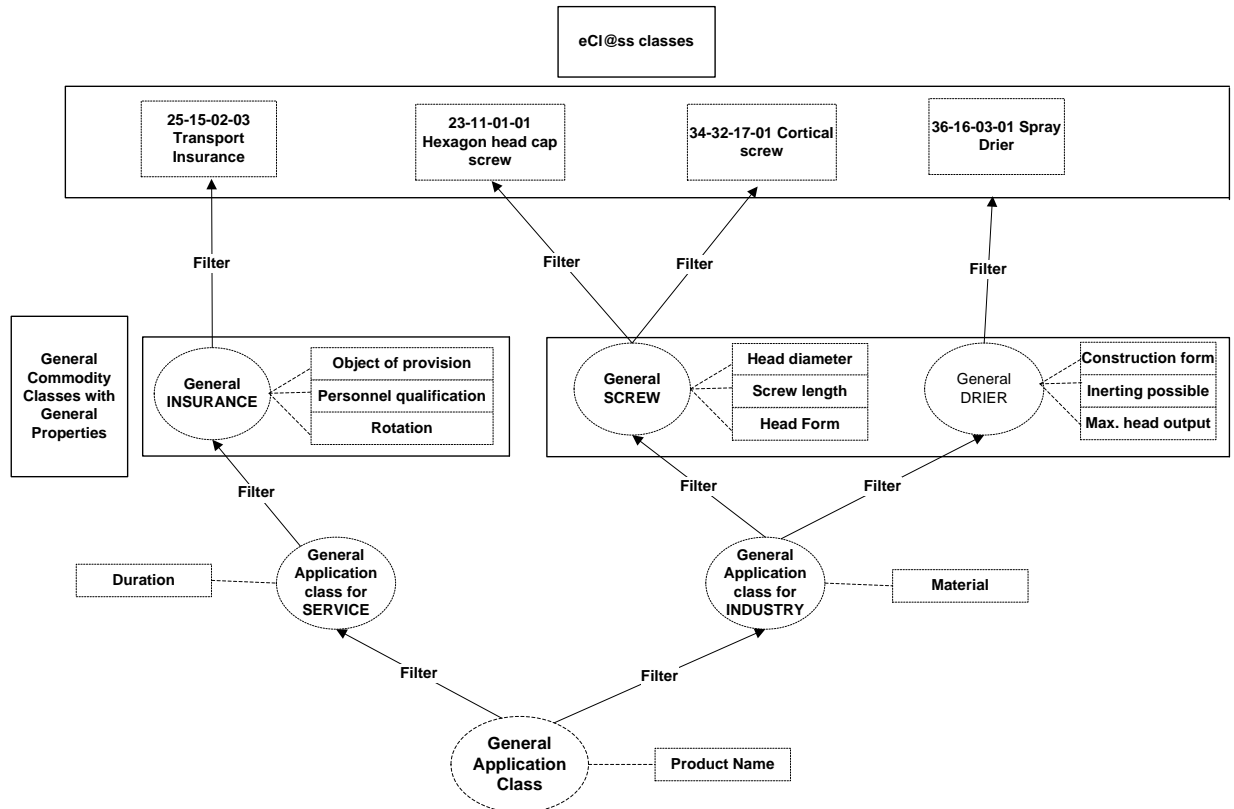


Figure 1 : Application classes support classification [1], [8], [9]

6. Harmonization of the Classifications of Commodities and Services

Different classification systems for commodities and services exist. The question is: Can we build bridges from one system to another?

In fact this is not so easy – as shown in [6]. When we compare CPV and eCI@ss only 10% of CPV classes have a unique corresponding eCI@ss class, and the other way round only 10% of eCI@ss classes have a unique corresponding CPV class – as shown in the table below.

	CPV to eCl@ss	eCl@ss to CPV
One to One	10%	10%
One to Many	8%	0%
Subtotal 1	18%	10%
One to None	34%	19%
Subtotal 2	34%	19%
Many to One	0%	8%
Many to Many	0%	0%
Subtotal 3	0%	8%
Many to None	0%	4%
Subtotal 4	0%	4%

Table 5: Mapping issues CPV-eCl@ss [6]

The table shows:

Subtotal 1: 121 + 12M mappings

One to One: One class is available in the source system and there is one equivalent class in the target system.

One to Many: One class is available in the source system and there is more than one equivalent class in the target system.

CPV to eCl@ss: One to One in detail: In 10% of all classes in CPV one class in CPV is matching with one class in eCl@ss.

CPV to eCl@ss: One to Many in detail: In 8% of all CPV classes one class in CPV has more than one matching in eCl@ss.

eCl@ss to CPV: One to One in detail: In 10% of all classes in eCl@ss one class in eCl@ss is matching with one class to CPV

Subtotal 2: 12N mappings

One to None: One class is available in the source system and there is no equivalent class in the target system

In 34% of all classes in CPV there is no equivalent class in eCl@ss.

In 19% of all classes in eCl@ss there is no equivalent class in CPV.

Subtotal 3: M21 + M2M mappings

Many to One: In 8% of all classes in eCl@ss more than one class in eCl@ss is matching with one class in CPV.

Subtotal 4: total of M2N mappings

Many to None: In 4% of all classes in eCl@ss more than one class in eCl@ss is matching with no class in CPV.

In [6] there are extended tables with more comparisons.

Anyway it is not easy to establish a bridge – and to maintain a bridge, because the classification systems continue to change. Experts have worked on such bridges since many years, but there is still no full and sufficient solution.

The analysis of the context of a class can help to find a corresponding class in another classification system with a similar context. If properties are available they can help to understand classes and find similar classes in other systems. If a class has properties dealing with lifting height, power, rotation, etc. it could be something like a pump.

To build bridges we need support from all disciplines that can help – from linguistics to artificial intelligence, from statistics to knowledge about applications.

7. Conclusion

The harmonization of classification systems dealing with commodities and services in trade and e-commerce is necessary and not yet solved. Cooperation among organizations maintaining classification systems can help and sophisticated concepts and tools to establish and maintain bridges.

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